

STRUCTURE OF THIS MICROCARD (BASIC INSTRUCTIONS)

A02 = How to use this microcard		1	2	3		4
A01 = Structure of microcard					SIS	
B01 = Trouble-shooting chart	A	***X*	X*XXX	XXXXX	XXXXX	*XXXX X
	B	*XXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	C	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	D	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	E	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XX
	F	XXXXX	XXXXX	XXXXX	XXX	
	G	XXXXX	XXXXX	XXX		
	H					
	J					
	K					
	L					
	M					
N01 = Service information	N	*XXXX	XXXXX	XXXXX	XXX	*X XX*
		12345	67890	12345	67890	12345 678
			1		2	
						Index
N28 = Table of contents and publication information						

- 1 = Special features
- 2 = Safety and precautionary measures
- 3 = Testers and tools
- 4 = Installation position of components

- a. Read from left to right.
- b. Title of micropicture (appears on each micropicture).

E16	Product/component/test step	
	Coordinate	
c. Limits of section		
<div>→</div> Beginning	<div>↔</div> Mid-section	<div>←</div> End
		<div>⇒ ⇐</div> One-page section
A01		⇒ ⇐

HOW TO USE THE MICROCARD

Trouble-shooting instructions for  
System: TZ-H  
Descriptions, photographs, terminal designations and special features refer to vehicle:  
SAAB 9000 Turbo 16  
2,0 l / 4 Zyl. 09.84→

These basic instructions are comprehensive trouble-shooting instructions. They must not be used as vehicle-specific instructions. Caution! Descriptions and photographs may deviate from the vehicle-specific brief instructions.  
Mandatory set values, terminal assignments and special features should be taken from the vehicle-specific brief instructions only. For brief instructions, see table of contents Microcard KFZ-00..

A02		⇒ ⇐
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## SPECIAL FEATURES

- \* Ignition distributor with no centrifugal advance, however with double-acting vacuum unit for intake pressure and charge-air pressure.
- \* Ignition-pulse booster (non-Bosch) for actuating systems dependent on ignition pulses.
- \* Knock control APC. (Non-Bosch system) acts on charge-air pressure.

## SAFETY AND PRECAUTIONARY MEASURES

Be sure to observe safety and precautionary measures so as to avoid risk to persons and to prevent damage to the engine, trigger boxes, control units or the ignition system.

### CAUTION!

High-energy ignition system with dangerous high and low voltages!

Touching live parts or terminals may be highly dangerous (both on the primary and secondary sides).

In this connection we should like to point out that VDE Regulations (in particular VDE 0104/7.67) and the pertinent local regulations are to be adhered to when performing work on or testing the ignition system.



SAFETY AND PRECAUTIONARY MEASURES  
(CONTINUED)

Never start engine without battery securely connected (battery terminals tightened).  
Do not disconnect battery from vehicle electrical system with engine running.

Do not use a fast charger for starting the engine.  
Provide starting assistance only with second 12 V battery and jump leads.  
Caution! Owing to non-standardized requirements of vehicle manufacturers with regard to electronic products, we advise against using a 24 V battery for starting assistance.

When charging the battery in the vehicle or providing starting assistance, follow the operating instructions for the fast charger as well as instructions of the vehicle manufacturer.

Disconnect battery from vehicle electrical system before charging or fast-charging.

Incorrect polarity of the supply voltage, e.g. through incorrect connection of the battery or ignition coil, may lead to the destruction of a control unit.

Do not connect or disconnect wiring-harness plugs from control units or trigger boxes with the ignition on.

Remove control units at temperatures above + 80° C (paint-drying installation).

Remove control units before carrying out electric welding work.

SAFETY AND PRECAUTIONARY MEASURES  
(CONTINUED)

When testing compression, detach trigger-box plug or permanently connect ignition coil term. 4 to ground with auxiliary cable (hazardous high tension, insulation damage on ignition coil, ignition distributor, ignition harness).

Note:

Auxiliary cable must feature at least 2 k  $\Omega$  interference suppression, e.g. sleeve-type suppressor (5 k  $\Omega$ )  
0 356 500 001.

Prescribed ignition coil (see part no.) is not to be replaced with a different ignition coil.

An interference-suppression capacitor is not to be connected to term. 1 of the ignition coil.

The positive terminal of the battery is never to be connected to term. 1 of the ignition coil as this will destroy the trigger box.

Do not short-circuit term. 1 of ignition coil to ground (e.g. to switch off engine), as this will destroy the ignition coil and possibly also the trigger box.

Ignition cable from ignition coil and ignition distributor term. 4 must not be detached during operation.

There must be no voltage flashover from term. 4 of the ignition coil to term. 1 and term. 15 of the ignition coil.

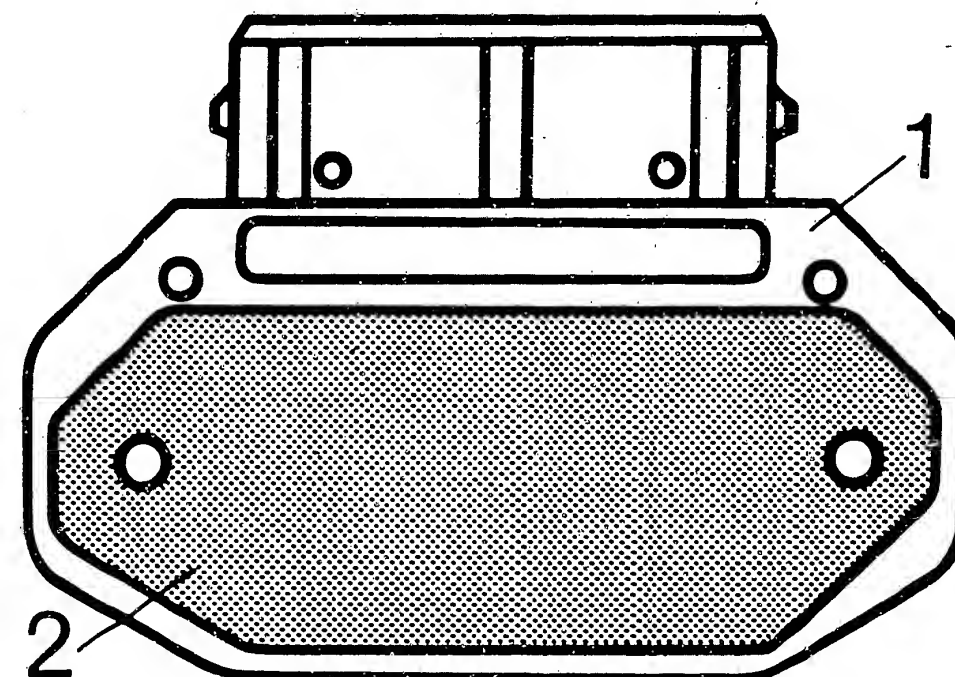
The secondary side of the ignition system must feature at least 2 k  $\Omega$  interference suppression, so as to prevent destruction of the trigger box. The original distributor rotor must be fitted with 1 k  $\Omega$ .

SAFETY AND PRECAUTIONARY MEASURES  
(CONTINUED)

Incorrect indication of engine speed, dwell angle and ignition point:

With this ignition system (trigger box with current limitation) there is a possibility of an incorrect indication of engine speed, dwell angle and ignition point on testers.

Refer to coordinates N10...N17 for more detailed information



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1 = Trigger box

2 = Base

SAFETY AND PRECAUTIONARY MEASURES  
(CONTINUED)

The base must be coated with thermal conduction compound before installing the trigger box.

Only apply thermal conduction compound with a suitable implement (screwdriver, match etc.).  
Do not apply thermal conduction compound to painted parts.

## TESTERS AND TOOLS

Engine tester e.g. Mot 206 0 684 000 206

Pulse-shaping circuit 1 684 463 154  
(required for measurement  
of primary voltage with  
MOT 201, 206 und 400)

Sleeve-type suppressor 5 k  $\Omega$  0 356 500 001

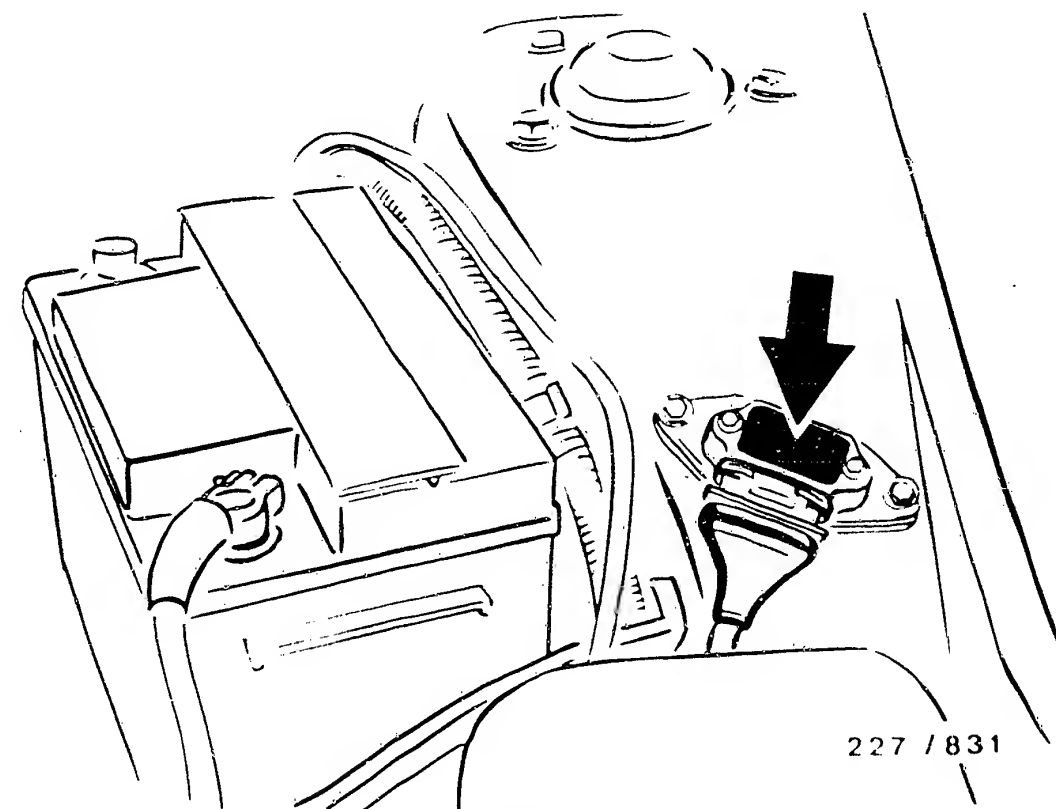
Ohmmeter ETE 014.00 0 684 101 400  
or e.g. Pontavi Wh 2 Commercially  
available

Voltmeter  
e.g. ETE 014.00 0 684 101 400

Test leads KDZS 0004  
(for proper connection of  
testers to connectors) KDZS 0005

Test prod, black 1 684 485 034  
Test prod, red 1 684 485 035  
(for proper connection  
of testers to connectors)

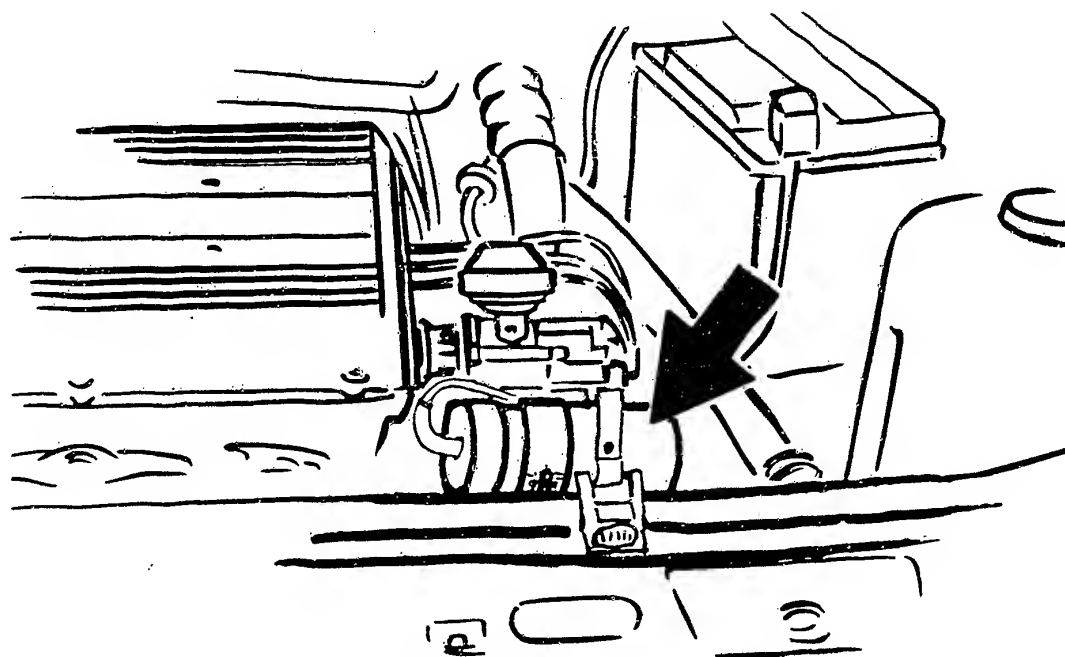
Thermal conduction compound 5 942 860 003



## INSTALLATION POSITION OF COMPONENTS

### Ignition trigger box:

The trigger box is located on a heat sink in the engine compartment at the left-hand wheel house.

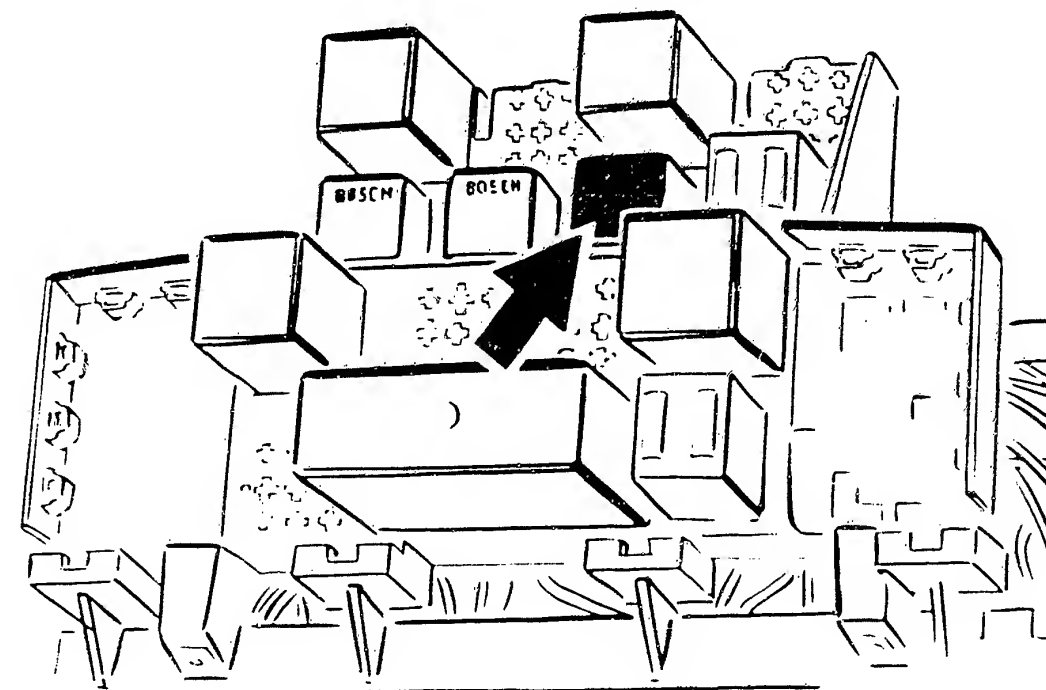


227 /1308

# INSTALLATION POSITION OF COMPONENTS (CONTINUED)

## Ignition coil:

The ignition coil is fitted in the engine compartment above the radiator.



227 /841

# INSTALLATION POSITION OF COMPONENTS (CONTINUED)

## Ignition-pulse booster:

The ignition-pulse booster is located in the central-electrics console behind the glove compartment. (Arrow)

## Removal instructions for central-electrics console:

Remove glove compartment.  
Unscrew central-electrics console and tilt it forwards.

## HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM

The TROUBLE-SHOOTING CHART starts with Coordinate B03 and contains customer complaint (fault symptom/fault characteristic feature) together with several possible causes in each case (component faults) and coordinate information for detailed trouble-shooting. If no coordinates are given, this is because the causes concerned do not require any test instructions.

In the event of a clearly established customer complaint, proceed consecutively and step by step as indicated in the trouble-shooting instructions in the stated sequence of possible causes.

Trouble-shooting should always be commenced with self-diagnosis (if provided) or with the universal test adapter (if envisaged). Only then should trouble-shooting be continued in line with the trouble-shooting chart.

In the event of a customer complaint which is not clear-cut, all causes indicated in the trouble-shooting chart must be tested. In order to avoid incorrect measurements, all causes are to be checked in the specified sequence (on account of interlinkage of test steps).

## HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM (CONTINUED)

The TROUBLE-SHOOTING PROGRAM contains all system and component tests indicated in the trouble-shooting chart. It is sub-divided into three rows of boxes.

The left-hand column contains test instructions and set values.

The center column contains information on trouble-shooting and fault elimination.

The right-hand column contains pictures/connection diagrams linked to the text together with explanatory notes.

If the questions posed in the left-hand column can definitely be answered with "yes", trouble-shooting is to be continued with the next box below.

If the answer to the question is "no", the center column must be applied and the tests performed in the sequence indicated there.

Following fault elimination, repeat test as a check.

### TEST PREREQUISITES:

- Battery fully charged
- Engine in proper mechanical working order (e.g. compression, valve clearance etc.)
- Engine at operating temperature of approx. +80°C (if necessary)
- Proper connection of all connectors of wiring harness



## TROUBLE-SHOOTING CHART

**Customer complaint (fault symptoms)**

1. Starting motor operates, engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Idle problems (engine speed, exhaust gas).
4. Poor throttle take-up, flat spot during acceleration.
5. Engine missing (ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on.
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

										Cause (component fault)	Coord.
*			*							HT side	B05
*										Firing sequence	—
*			*							Ignition coil	B07
*										Ignition-distributor as-installed setting	B09
*										Voltage, trigger box	B11
*										Voltage, primary circuit	B13
*										Ignition-distributor plug and socket	B15
*										Voltage supply, magnetic pulse generator	B17
*										Magnetic-pulse-generator function	B19
*										Contact resistance (primary side)	B21
*										Primary signal	B25
*										Ignition-pulse booster (signal check)	B27

### TROUBLE-SHOOTING CHART (CONTINUED)

**Customer complaint (fault symptoms)**

1. Starting motor operates, engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Idle problems (engine speed, exhaust gas).
4. Poor throttle take-up, flat spot during acceleration.
5. Engine missing (ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on (dieseling).
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

								Cause (component fault)	Coord.
*		*	*		*	*		Ignition point and ignition timing	C01
			*					Voltage, trigger box (engine idling)	C03
			*					Voltage, ignition coil (engine idling)	C05
*								Peak-coil-current cutoff	C07
			*					Primary voltage (engine idling)	C09

TROUBLE-SHOOTING PROGRAM ( 1 )

V

Test high-voltage side.

N>

Repair high-voltage side.

Test spark plugs, spark-plug connectors, suppression resistors, H.T. ignition cables, distributor cap, distributor rotor etc. for proper operation (e.g. open circuit, shunt).

Assessment e.g. through ignition oscillogram, resistance measurements and visual check.

High-voltage side O.K.?

Y

V

Return to trouble-shooting chart B03

B05

==>

B06

<==>

# TROUBLE-SHOOTING PROGRAM ( 2 )

Check ignition coil

Visual examination:

Remove protective cap from ignition coil and check whether plug is in position and whether sealing compound has escaped.  
See picture.

Electrical check:

Ignition coil primary term. 15 and term. 1

(Take resistance of test lead and test prods into account)

Set value: see brief instructions

Ignition coil secondary term. 1 and term. 4

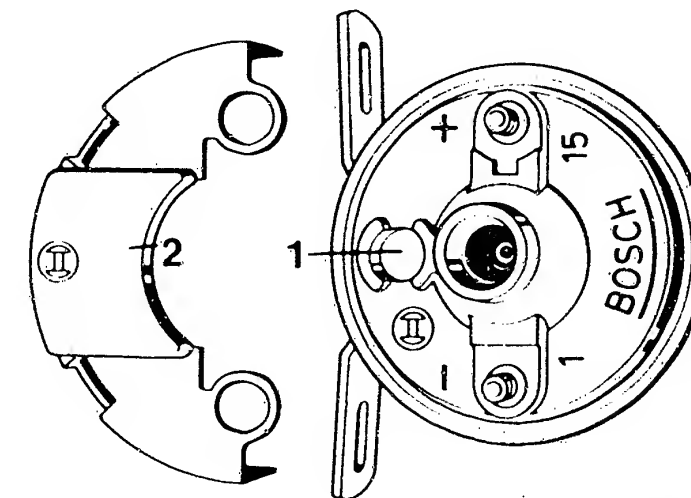
Set value: see brief instructions

Visual examination O.K./set value obtained?

N>

1. Renew trigger box and ignition coil if there is no plug present or if sealing compound has leaked out.

2. Renew ignition coil if set values are not O.K.



227/004H

1 = Plug  
2 = Protective cap

Return to trouble-shooting chart  
B03

B07

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B08

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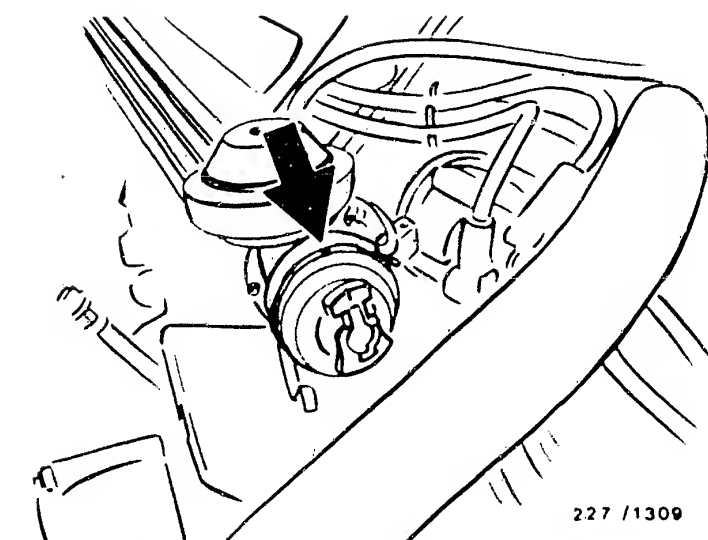
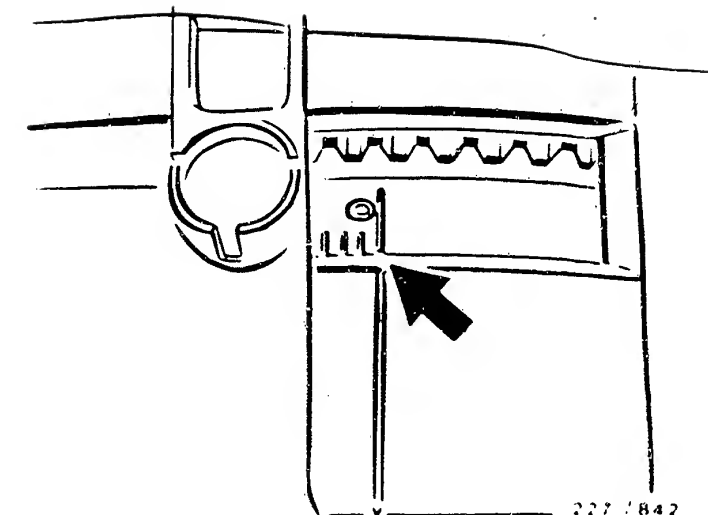
# TROUBLE-SHOOTING PROGRAM ( 3 )

Test ignition-distributor as-assembled setting.  
Turn crankshaft until cyl. No. 1 is at TDC in compression stroke.  
(Flywheel in TDC position).  
See top picture, arrow.

Check position of distributor rotor.  
The distributor rotor must be situated such that the center of the distributor-rotor electrode faces the mark on the distributor housing.  
See bottom picture, arrow.

Ignition-distributor as-assembled setting O.K.?

Adjust ignition distributor.



Return to trouble-shooting chart B03

B09

B10

# TROUBLE-SHOOTING PROGRAM ( 4 )

Test trigger-box voltage.

Detach trigger-box plug and connect  
voltmeter to term. 4 (+) and  
term. 2 (-).  
See picture.

Switch on ignition.

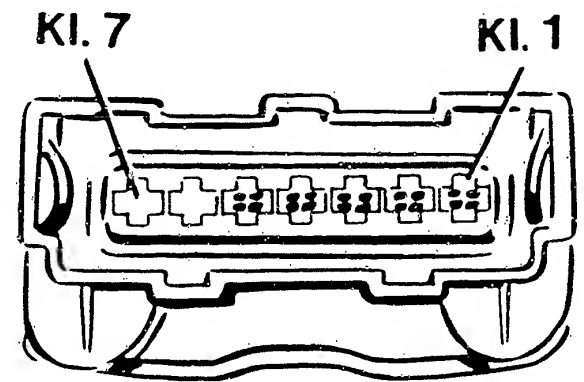
Set value: battery voltage

Is set value attained?

N>

Check for open circuit in leads  
and connections between ignition/  
starting switch and trigger-box  
plug term. 4 including ground  
lead term. 2.

Eliminate open circuit.



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Return to trouble-shooting chart  
B03

B11

<=>

B12

<=>

# TROUBLE-SHOOTING PROGRAM ( 5 )

Test primary-circuit voltage.

Detach trigger-box plug and connect voltmeter to term. 1 (+) and term. 2 (-).  
See picture.

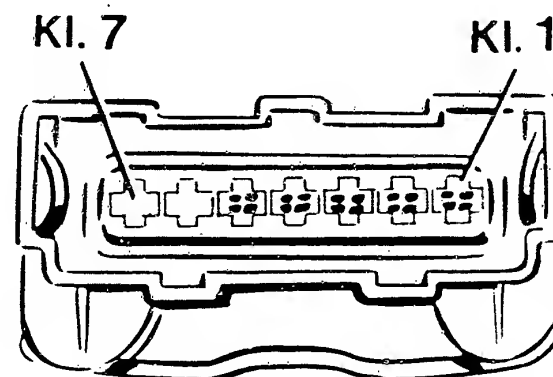
Switch on ignition.

Set value: battery voltage

Is set value attained?

N>

Test for open-circuit in lead from ignition and starting switch to ignition coil term. 15, primary winding of ignition coil and lead from ignition coil term. 1 to trigger-box plug term. 1 including ground lead term. 2.  
Eliminate open-circuit.



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Return to trouble-shooting chart B03

B13

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B14

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# TROUBLE-SHOOTING PROGRAM ( 6 )

Test ignition-distributor plug and socket.

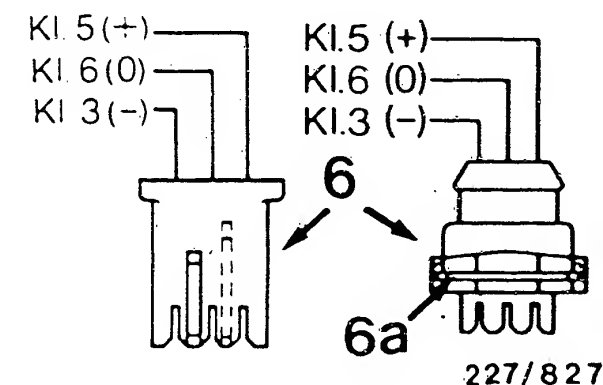
Detach ignition-distributor plug.

Various ignition-distributor plugs.  
See top picture.

Visual inspection:  
Check contacts of ignition-distributor plug and socket for oxidation.

Contacts O.K.?

Eliminate oxidation.



6 = Ignition-distributor plug,  
old version with guide  
lug on the left,  
new version on right  
6a = Wire clip

Return to trouble-shooting chart  
B03

B15

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B16

<=>

# TROUBLE-SHOOTING PROGRAM ( 7 )

Voltage supply, magnetic pulse generator.

Ignition-distributor and trigger-box plug attached.

Push back rubber sleeve of ignition-distributor plug.

Connect voltmeter to ignition-distributor plug term.5 (+) and term.3 (-).

Refer to picture.

Switch on ignition.

Set value: equal to/greater than 10 V.

Is set value attained?

N>

Detach ignition-distributor plug.

Connect voltmeter to ignition-distributor plug term.5 (+) and term.3 (-).

Ignition ON.

If voltage is less than 10 V, check for short to ground in lead from ignition-distributor plug term. 5 to trigger-box plug term. 5.

Renew trigger box if there was no short to ground.

Renew magnetic pulse generator if voltage is equal to/greater than 10 V.

If voltage is 0 V, then connect ohmmeter consecutively to:

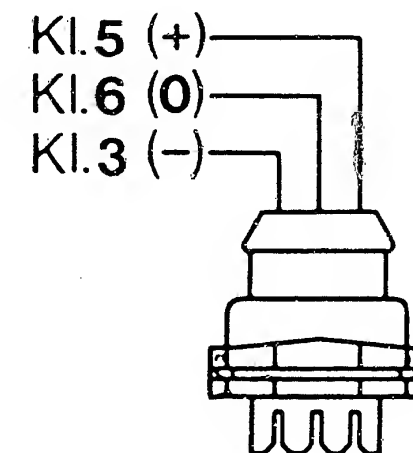
Ignition-		Trigger-box
distributor		plug
plug		plug

Term. 5	and	Term. 5
Term. 3	and	Term. 3

Set value: approx. 0  $\Omega$  in each case (continuity).

Eliminate open circuit.

Renew trigger box if there was no open circuit.



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Return to trouble-shooting chart B03

B17

<=>

B18

<=>



# TROUBLE-SHOOTING PROGRAM ( 8 )

Test magnetic-pulse-generator function.

Ignition-distributor and trigger-box plug is attached.

Push back rubber sleeve of ignition-distributor plug.

Connect oscilloscope in program-selector-switch setting "special" in accordance with operating instructions.

For example MOT 206:

Red terminal to ignition-distributor plug term. 6 (measurement signal). See top picture.  
Black terminal to vehicle ground.

Start engine.

Oscilloscope must indicate rectangular pulse.  
See bottom picture.

Rectangular pulse present?

N>

Detach ignition-distributor plug and trigger-box plug.

1.  
Check lead from ignition-distributor plug term. 6 to trigger-box plug term. 6 for open circuit, short to ground or short to positive.

Eliminate fault.

Attach trigger-box plug.

2.  
Connect voltmeter to ignition-distributor plug term. 6 (+) and vehicle ground (-).

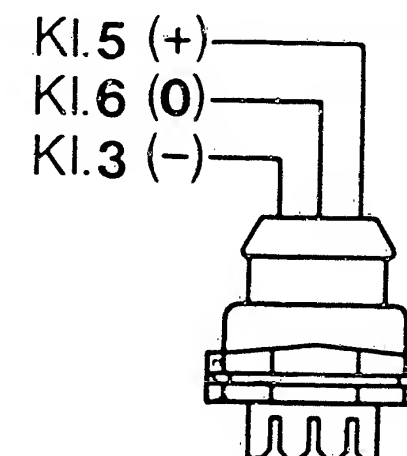
N o t e :  
Use voltmeter with internal resistance ( $R_i$ ) greater than  $50\text{ k } \Omega / \text{V}$  (otherwise incorrect measurement).

Ignition ON.

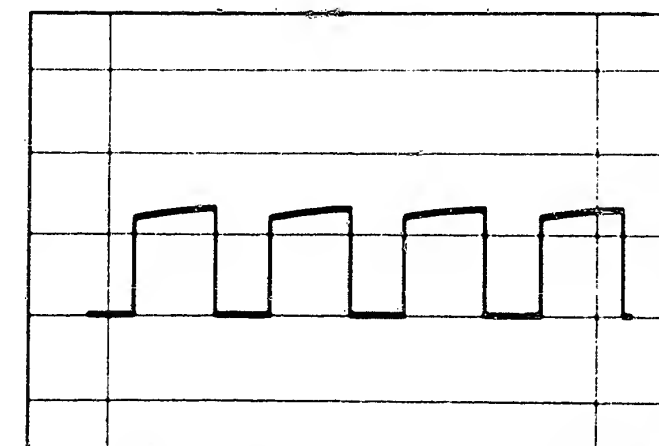
Set value: equal to/greater than 2 V.

Renew trigger box if set value was not attained.

Renew magnetic pulse generator/ignition distributor if items 1 and 2 O.K.



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22710096

Return to trouble-shooting chart B03

# TROUBLE-SHOOTING PROGRAM ( 9 )

Test contact resistance (primary side).

Disconnect negative and positive leads of battery.  
Detach trigger-box plug.  
See picture.

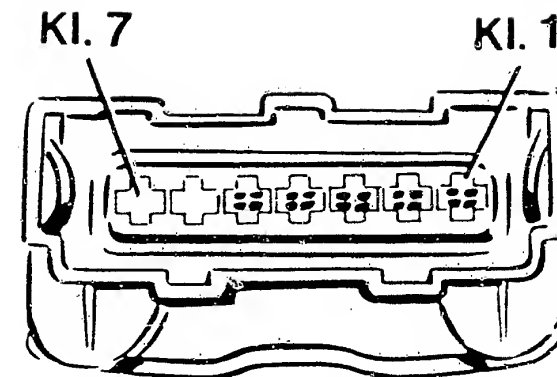
Switch on ignition.

Test for contact resistance in leads from positive battery terminal to trigger-box plug term. 4 including leads from negative battery terminal to trigger-box plug term. 2.  
See picture.  
(Take account of resistance of test lead/test prods).

Set value: see brief instructions

Is set value attained?

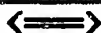
Eliminate contact resistance.



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Continued on next picture page

B21



B22



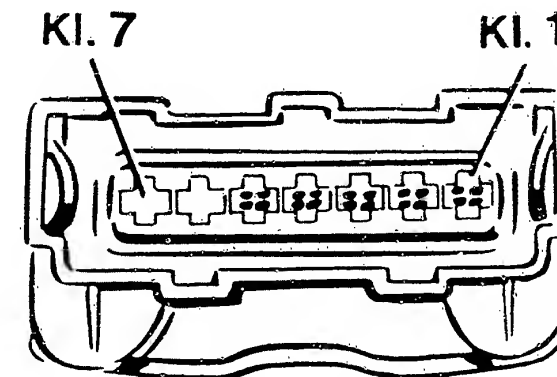
# TROUBLE-SHOOTING PROGRAM ( 9 ) CONTINUED ( 1 )

Test for contact resistance in leads from positive battery terminal to ignition coil term. 15 as well as in lead from ignition coil term. 1 to trigger-box plug term. 1.  
See picture.  
(Take account of resistance of test lead/test prods).

Set value: see brief instructions

Is set value attained?

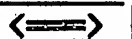
Eliminate contact resistance.



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Return to trouble-shooting chart B03

B23



B24



## Test primary signal

Trigger-box plug connected.

## Primary signal with oscilloscope

Connect oscilloscope as per operating instructions to ignition coil term. 15 (+) and term. 1 (-).

Start engine.

Set value:

Oscilloscope must indicate a primary voltage (of any magnitude). See picture.

O R

## Primary signal with engine-speed tester

Connect engine-speed tester as per operating instructions to ignition coil term. 15 (+) and term. 1 (-).

Start engine.

Set value:

Engine-speed tester must indicate a value (irrespective of magnitude).

Primary signal present?

N>

Renew trigger box.



Y  
V

Return to trouble-shooting chart  
B03

# TROUBLE-SHOOTING PROGRAM (11)

Ignition-pulse booster.  
(Signal check)

Ignition-distributor and trigger-box plug attached.

Connect up oscilloscope in program-switch setting "Special" as per operating instructions.

For example MOT 206:

Red terminal to ignition test connection term.5 (Measurement signal).

See top picture.

Black terminal to vehicle ground.

Start engine.

Oscilloscope must indicate rectangular pulse.

See bottom picture.

Rectangular pulse present?

N>

Detach ignition-pulse booster from central-electrics console.

Connect up oscilloscope in program-switch setting "Special" with red terminal to relay frame term. TD-I and with black terminal to vehicle ground.

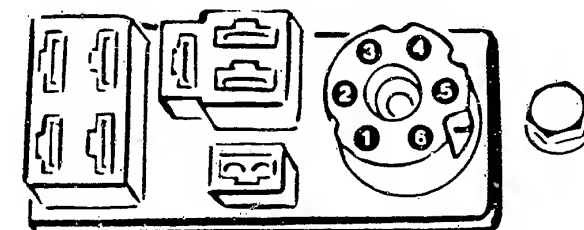
Actuate starting motor.

Oscilloscope must indicate rectangular pulse.

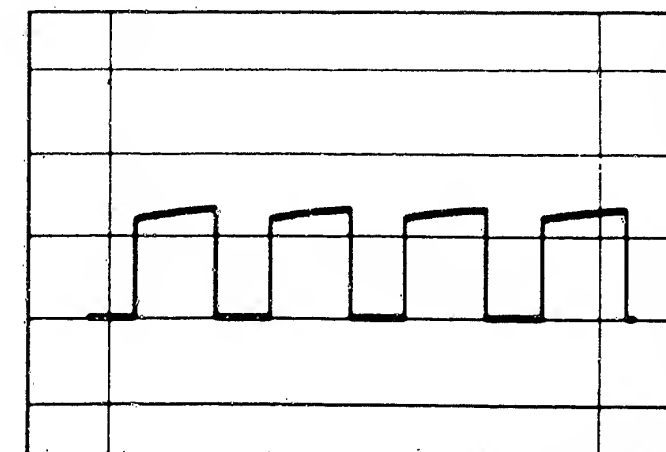
If rectangular pulse was present, check ignition-pulse booster as to voltage supply and function.

If no rectangular pulse was present, check lead from trigger box term.7 to ignition-pulse booster term. TD-I for open circuit, short to positive and short to ground.

Renew trigger box if no fault present.



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Return to trouble-shooting chart  
B03

TROUBLE-SHOOTING PROGRAM (12)

V

Test ignition point and advance.  
Connect Motortester as per operating instructions.  
  
Set value: see test specifications  
(e.g. Autodata)  
  
Is set value attained?

N>

Adjust ignition point, renew defective parts.

Y

Return to trouble-shooting chart B03

# TROUBLE-SHOOTING PROGRAM (13)

## Test trigger-box voltage.

Push back rubber sleeve of trigger-box plug and connect voltmeter to term. 4 (+) and term. 2 (-).  
See picture.

Allow engine to idle.

Set value: 12..14 V or a maximum of 1 V below battery voltage.

Is set value attained?

N>

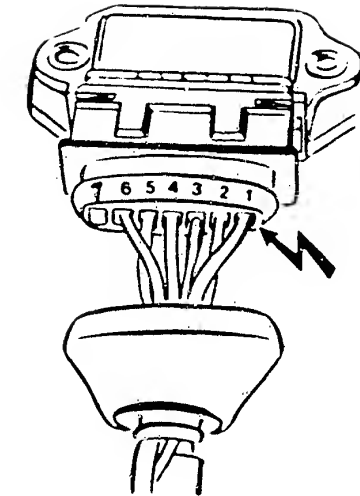
Disconnect negative and positive lead of battery.  
Detach trigger-box plug.  
Switch on ignition.

Check for contact resistance in following leads:

1. From battery negative terminal to trigger-box plug term. 2
2. From positive battery terminal to trigger-box plug term. 4

Contact resistance during testing of items 1 and 2 max. 0.3  $\Omega$   
(take account of resistance of test prods/test lead).

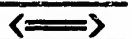
Eliminate contact resistances.



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Return to trouble-shooting chart B03

C03



C04



# TROUBLE-SHOOTING PROGRAM (14)

Y

Check voltage of ignition coil.

Connect voltmeter to ignition coil term. 15 (+) and battery negative terminal.

Allow engine to idle.

Set value: equal to/greater than 10 V

Is set value attained?

N>

Disconnect positive lead from battery; switch on ignition.

Check for contact resistance in leads between positive battery terminal and ignition coil term.15.

Contact resistance may be max. 0.3  $\Omega$  (take resistance of test prods and test leads into account)

Eliminate contact resistance.

Y

Return to trouble-shooting chart  
B03

C05

<==>

C06

<==>



TROUBLE-SHOOTING PROGRAM (15)

V

Test peak-coil-current cutoff.

Connect voltmeter to ignition coil  
term. 15 (+) and term. 1 (-).

Switch on ignition.

Set value: voltmeter may briefly  
deflect for approx. 1 s.  
Voltmeter must return to 0 V.

Is set value attained?

N>

Replace trigger box and  
ignition coil.

Y

V

Return to trouble-shooting chart  
B03

C07

<==>

C08

<==>

# TROUBLE-SHOOTING PROGRAM (16)



Test primary voltage.  
(If MOT series present)

N>

Replace trigger box.

Connect oscilloscope (e.g. MOT 206)  
together with pulse-shaping circuit  
1 684 463 154 to ignition coil as  
per operating instructions.

Note:

Incorrect measured value without  
pulse-shaping circuit.

Allow engine to idle.

Set value: see picture/brief  
instructions

Is set value attained?



Return to trouble-shooting chart  
B03

C09

<==>

C10

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\* = See brief instructions

## DANGER OF ACCIDENT ON SEMI- CONDUCTOR IGNITION SYSTEMS

|22|  
VDT-I-227/102 En  
03.1981

Supersedes Feb. 3, 1976 edition

Please be sure to pass this bulletin together with VDE 0104/7.67 enclosed on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ago to manufacturers starting to equip their vehicles with semi-conductor ignition systems as original equipment.

In most cases, the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected. This means that semi-conductor ignition systems have reached the point where contact with "live" components or terminals (whether on the primary side or the secondary side) can prove fatal.

In this connection, we should like to point out to you that the laws valid in your country regarding work on high-voltage systems must be adhered to when working on, or testing, semi-conductor ignition systems.

As a matter of principle, when working on such ignition systems, the ignition is to be switched off.

Included in such work are the following operations:

- \* Connection of engine testing equipment (timing strobe, dwell-tach tester, ignition oscilloscope etc.)
- \* Replacement of ignition system components (spark plugs, ignition coil, ignition distributor, H.T. ignition cables etc.)

If it is necessary to switch on the ignition in order to test the system or make adjustments on the engine (to the carburetor, for instance), then lethal voltages are present throughout the entire system.

This means that the danger of accident exists not only at the individual components in the system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also at the wiring harness (e.g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

In addition, in the case of the capacitor-discharge ignition system (CDI), danger of accident is also present under the following circumstances:

- \* Operation of the trigger box without the ignition transformer.
- \* At the trigger box, (removed), relatively soon after it has been switched off (capacitor discharge).

Below is a typical terminal diagram of a semi-conductor ignition system, the dangerous locations being marked with high-voltage arrows.

We would point out that all semi-conductor ignition systems, even the older versions, are to be regarded as dangerous in the sense as defined by this bulletin.

## EFFECTS OF ELECTRICAL AND ELECTRONIC SYSTEMS ON HEART PACEMAKERS

VDT-I-227/107 En  
01.1981

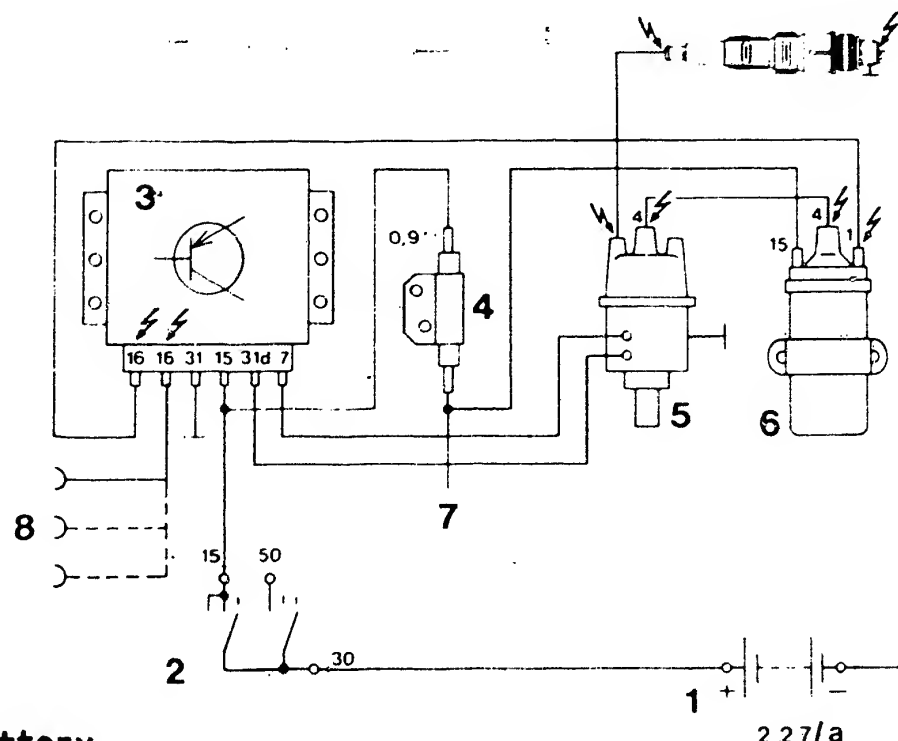
e.g. Ignition systems, Jetronic, Motronic, ABS

Please ensure that this Bulletin is passed on to your employees for their attention.

We have often been asked by some of our customers whether or not patients with heart pacemakers are endangered in any way by ignition systems. This theme was recently the subject of an examination carried out by the Ignition System Development Department of Robert Bosch GmbH in conjunction with Dr. Thull, lecturer at the Central Institute for Biomedical Technology at the University of Erlangen-Nürnberg and Biotronic GmbH & Co. of Berlin, a manufacturer of heart pacemakers. The magazine "Biomedizinischen Technik" (5/80) published the results.

The most important discoveries in this practice can be summarized from the examination report as follows:

1. Heart pacemakers corresponding to the latest state of the art are not affected by radiation (electromagnetic fields) from ignition systems.
2. With a stationary engine and the ignition switched off, the heart pacemaker is not affected by any part of the ignition system, even when unintentionally touched. Maintenance work in the engine compartment, for example, can then be carried out without any danger.



- 1 = Battery
- 2 = Ignition/starting switch
- 3 = Trigger box
- 4 = Resistor
- 5 = Ignition distributor
- 6 = Ignition coil
- 7 = to starting motor term. 15a
- 8 = to tachometer connection or diagnostic plug or TD terminal

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3. With the engine running or stationary with the ignition switched on, touching current-carrying parts of the ignition system, as well as parts of any other electrical system, presents a certain danger for everybody. The heart pacemaker can here be affected under certain conditions (voltage, current and frequency). Patients with heart pacemakers should therefore at all costs avoid touching current-carrying parts of electrical systems.

4. Furthermore, patients with heart pacemakers are more inclined to psychic shock effects than other people, even when they receive just a harmless electric shock, because many such patients are conscious of the increased danger to the cardiac activity.

We therefore consider it inadvisable for patients with heart pacemakers to be employed in workshops or on vehicles where ignition systems are being tested or repaired. If any members of your staff have heart pacemakers, please introduce the necessary measures.

We would like to add that heart pacemakers are not expected to be affected in any way by interference from other electronic products and systems which we manufacture, such as the Antiskid System (ABS), Jetronic, Motronic, because the much greater radiation intensity of the ignition systems examined in normal use has not caused any interference to heart pacemakers corresponding to the latest state of the art.

If you should receive questions on this matter from customers, please inform them accordingly.

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# TECHNICAL BULLETIN

## NEW DESIGNATIONS FOR IGNITION SYSTEMS

VDT-I-227/108 En  
01.1983

Supersedes 5.1981 edition

The introduction of new ignition systems has made it necessary to reclassify all designations.

The designations listed below will be used immediately in KH workshop and sales literature.

Designation	Abbreviated code	Meaning	Switching	Ignition ctrl. and spark adv.	High-voltage dist.
Coil ignition	ZS (CI)		Mechanical (breaker points)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized coil ignition	TSZ-K (TCI-c)	K=breaker-triggered	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Trigger box with conventional circuit techniques	TSZ-I * (TCI-i)	I=Induction-type pulse gen.	Electronic (trigger box)	Mechanical (ignition dist.)	Mechanical (ignition dist.)
	TSZ-H (TCI-h)	H=Hall generator	Electronic (trigger box)	Mechanical (ignition dist.)	Mechanical (ignition dist.)

Designation	Abbreviated code	Meaning	Switching	Ignition ctrl. and spark adv.	High-voltage dist.
Transistorized ignition	TZ-I * (TI-i)	I=Induction-type pulse gen.	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
(Trigger box in hybrid technique)	TZ-H * (TI-h)	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Breakerless semi conductor ignition with or without knock control	EZ (EI) (EZ-K) (EI-k)	K=Knock control	Electronic (trigger box or control unit)	Electronic (control unit)	Mechanical (ignition distributor or high-voltage distributor)
Distributor-less ignition with or without knock control	VZ (FEI) VZ-K (FEI-k)	K=Knock control	Electronic (control unit)	Electronic (control unit)	Electronic (dual-spark ignition coil, or 1 ignition coil for each spark plug)

### \* Note:

The ignition system can also be equipped with a DLS unit (digital idle stabilization) or with an ELS unit (electronic idle stabilization) or with an ESV unit (electronic ignition retardation).

## MOTOR VEHICLE SERVICE INFORMATION

INCORRECT DISPLAY OF ROTATIONAL SPEED AND DWELL ANGLE ONLY WITH TRIGGER BOXES 0 227 100 .. (TCI-1, TCI-h) WITH CURRENT LIMITATION VDT-I-Gen. 030 En 02.1981  
Supersedes ed. 6.1980

For additional information, see VDT-I Gen. 032 En

### 1. General

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period, the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle when testing the ignition system. However, there is no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Incorrect displays may occur with the testers listed below:

MOT 001.00	Rotational-speed	KTE 001.00
001.01	display O.K. with	001.02
001.02	these testers	001.03
001.04		
002.00		

By now, the following vehicles may be fitted with breakerless ignition systems with current limitation:

Audi	(Bosch/Fairchild ignition system)	Mazda	(Mitsubishi ignition system)
BMW	(Bosch ignition system)	Mitsubishi	(Mitsubishi ignition system)
Citroen	(Delco ignition system)	Nissan	(Hitachi ignition system)
Fiat	(Delco ignition system)	Datsun	(Bosch ignition system)
Ford	(Delco ignition system)	Peugeot	(Bosch ignition system)
General Motors	(HEI ignition system)	VW	(Bosch/Fairchild ignition system)
		Bosch transistorized ignition system for retrofitting	
		0 227 100 920	

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## 2. Test instructions

### 2.1 Rotational speed

Incorrect rotational-speed display can be recognized as follows:

If one starts at the idle speed and slowly increases the engine speed, then the incorrect display can be recognized by an abrupt reduction in the rotational-speed display (e.g. from  $2400 \text{ min}^{-1}$  to  $1200 \text{ min}^{-1}$ ).

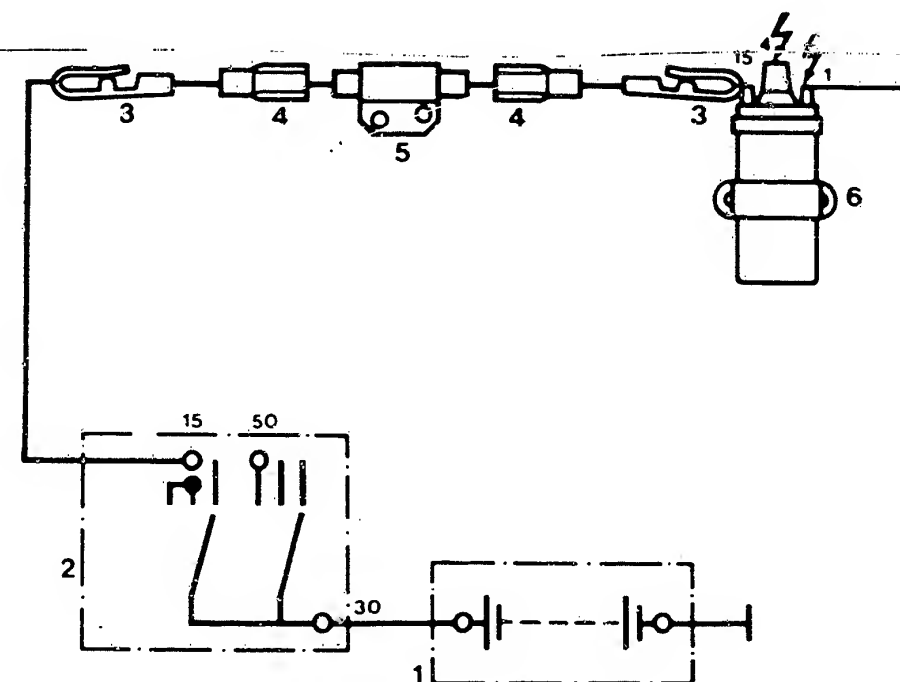
It is, however, possible to attain correct rotational-speed measurements:

Connect a ballast resistor of 0.9 or 1.0 Ohms (see Fig.) in series in the line to term. 15 of the ignition coil (take care not to cause a short circuit). After the rotational-speed measurement, the ballast resistor must be removed (otherwise starting difficulties and misfiring). Connect tester as per operating instructions.

### Suggestion for user manufacture

#### Required parts:

1 ballast resistor 0.9 Ohms	Part no. 0 227 900 002
or	
1 ballast resistor 1.0 Ohms	Part no. 0 227 900 101
2 blade receptacles	Part no. 1 901 355 881
e.g. approx. 0.2 m cable, 1.5 mm <sup>2</sup> e.g.	Part no. 6 210 150 150
2 insulated clips	Commercially available



- 1 = Battery  
2 = Ignition/starting switch  
3 = Terminals  
4 = Blade receptacle  
5 = Series resistor  
6 = Ignition coil

Danger arrows: Warning: 400 V...25 KV

### 2.2 Dwell angle

The dwell angle is electronically controlled.  
The dwell angle is no longer measured.

### 2.3 Ignition timing

Is correctly indicated. Tester connections according to operating instructions.

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## MOTOR-VEHICLE SERVICE INFORMATION

### MOTORTESTER CONVERSION

VDT-I-Gen. 032 En

Incorrect indication of engine speed,  
dwell angle and ignition point  
only with trigger boxes

06.1980

0 227 100 .. (TCI-I, TCI-H) with current limitation

For additional information see

VDT-I-Gen. 030 of 06.1980

Concerns: Motortester EFAW 268

268 S 10

269

214 B

AE 2000

#### 1. General

Please arrange for above-quoted motor-testers in your workshop as well as at your customers (e.g. motor-vehicle workshops, petroleum companies, gas stations, vocational schools etc.) to be converted. Conversion is subject to payment and is performed by the K7 after-sales service of the responsible BG. The standard time is 15 work units (with installation of switch).

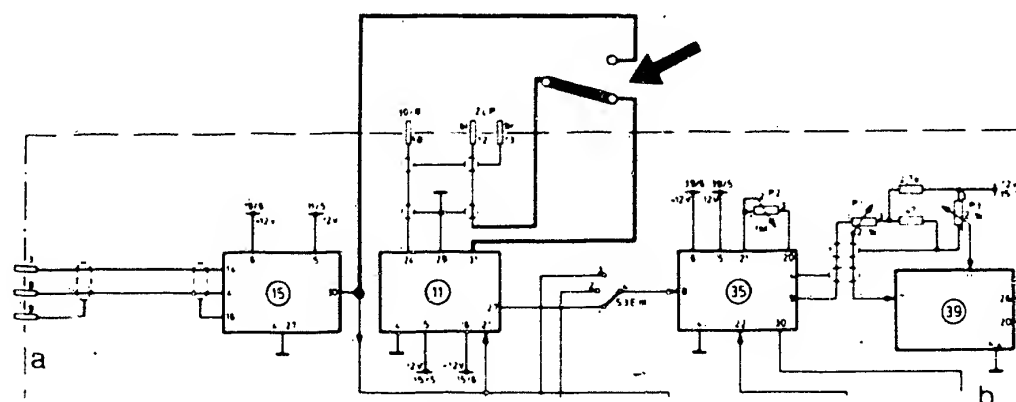
#### 2. Why convert motortesters?

Transistorized ignition systems with current limitation have a different primary-voltage characteristic from conventional ignition systems. During the dwell period, the voltage at terminal 1 of the ignition coil may assume values between 1.5 V and battery voltage (or greater), which, when checking the ignition system, may lead to an incorrect indication of engine speed and dwell angle and to incorrect triggering of the counter.

There is, however, no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Since, with the above-listed motortesters, the timing strobe is triggered by the signal-path dwell-angle meter, this incorrect triggering also leads to incorrect flashing and thus to an incorrect display of the advance angle.

#### 3. Conversion measures

The situation is to be remedied by modifying the wiring of the testers so that the timing strobe is triggered by the clamp-on induction pickup and the pulse shaper stage.



227/e

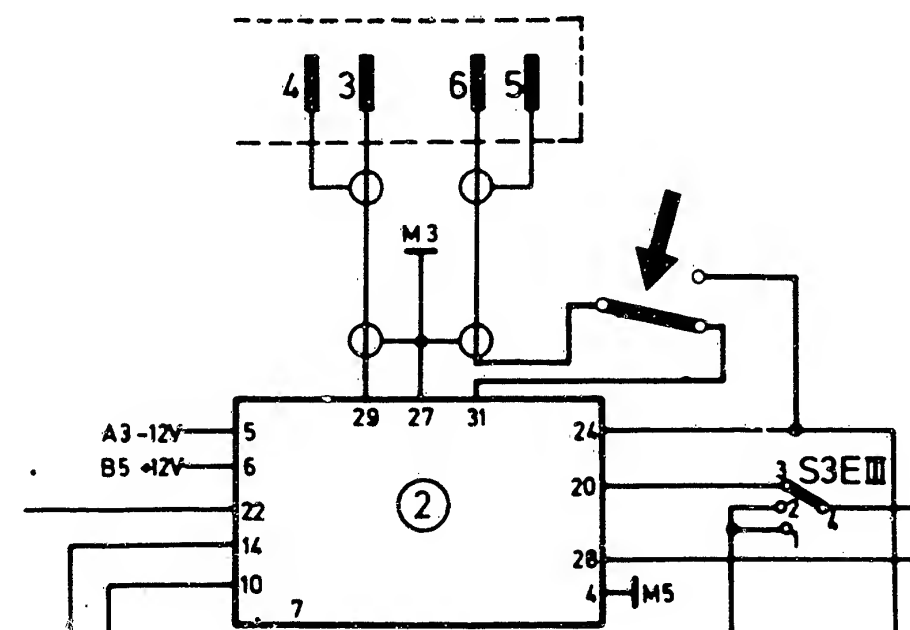
a = Clamp-on induction pickup  
b = (Extract from WJF 508/1, Page 53)

EFAW 268, 268 S 10, 269, AE 2000

Remove the line of the ZLP from pin 31 of printed board 11 (coupling stage) and connect to pin 30 of printed board 15 (pulse shaper stage) via a switch with change-over contact (e.g. 0 341 500 803).

In addition, a new line must be connected from pin 31 of printed board 11 to the other contact of the switch with change-over contact.

Arrow points to switch with change-over contact.



227/f

(Extract from WJF 503/1, Page 64))

EFAW 214 B

Remove the line from terminal 6 of printed board 16 to pin 31 of printed board 2 (coupling stage) and connect to pin 24 of the same printed board via a switch with change-over contact (e.g. 0 341 500 803).

In addition, a new line must be connected from pin 31 of printed board 2 to the other contact of the switch with change-over contact.

Arrow points to switch with change-over contact.

By fitting the switch with change-over contact in the front panel of the motortester, it is possible to switch over from standard ignition systems to those with current limitation. We recommend that the switch positions be marked correspondingly:  
e.g. "Standard" - "Current limitation".  
These conversion measures have already been published in the K7 information sheet KJF 28/7911.

#### 4. Test instructions

##### 4.1 Standard ignition systems

Switch position: "Standard".

All other tester connections as per operating instructions.

##### 4.2 Ignition systems with current limitation

Switch position: "Current limitation".

In order to trigger the timing strobe, the induction-type pulse generator (clamp-on pickup or red pickup) must always be connected during the measurement.

The selector switch for ignition systems built into the motortester must be switched to standard coil ignition (not to TCI) with these ignition systems.

All other tester connections as per operating instructions.

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

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## MOTOR VEHICLE SERVICE INFORMATION

TESTS ON ELECTRONIC IGNITION  
SYSTEMS (TCI, TI)  
TESTER INSTRUCTIONS

VDT-I-Gen. 035 En  
03.1981

The following tests are listed in older and current Tester operating instructions or in "Trouble-shooting with the oscilloscope":

- \* "Separate ignition coil test"  
(Concerns EFAW 213, 214, 268, AE 2000)
- \* Calculating the "ignition voltage reserve"  
(Concerns EFAW 213, 214, 268, AE 2000 and MOT series).
- \* "Intensified insulation test"  
(Concerns EFAW 213, 214, 268, AE 2000 and MOT series).

Nowadays, transistorized ignition systems deliver more than 30,000 V secondary voltage.

To avoid damage to ignition coil, ignition cable and ignition distributor by voltage flashovers, the tests listed above should not be carried out on transistorized ignition systems.

The contents of this Service Information has already been published in the K7 Information K7-VJF 17/8012.

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